DFH50CU12F0H1

1200V Dual Boost Hybrid Power Module

Description

The DFH50CU12F0H1 is a Dual Boost Power Module. It integrates high performance IGBT chips and SiC Diodes designed for the applications such as Solar Inverter, UPS, Fuel cell- DC/DC converter, Energy storage Systems.

Features

- Blocking voltage :1200V
- low saturation voltage $V_{CE(sat)}$
- SiC Diode
- 1600V Bypass and Anti-parallel Diodes
- Low Inductive Design
- Low thermal resistance
- Thermistor inside

Applications

- Solar Inverter
- Fuel cell- DC/DC converter
- Uninterruptible Power Supplier
- Energy Storage Systems

Circuit diagram

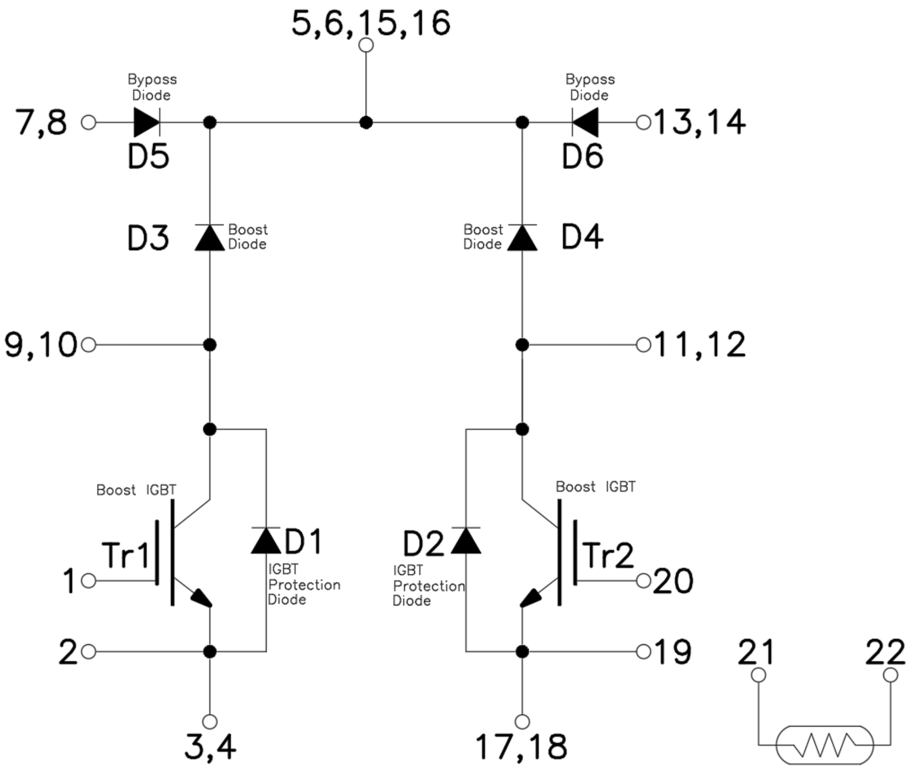


Figure 1. Out drawing & circuit diagram for DFH50CU12F0H1

Pin Configuration and Marking Information

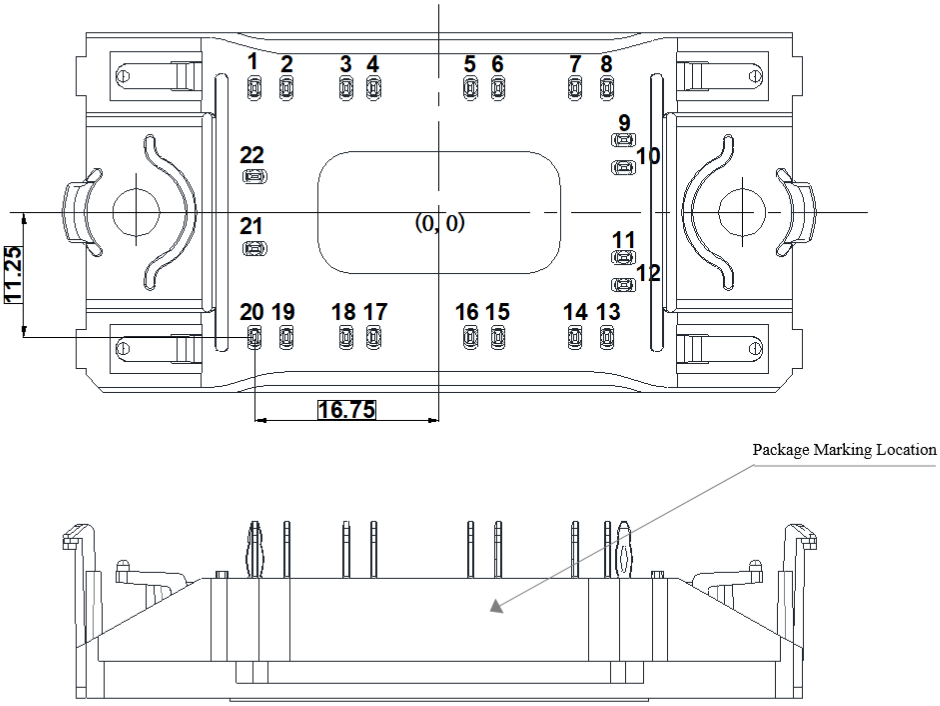


Figure 2. Pin configuration

Module

Parameter	Conditions	Value	Unit
Isolation Voltage	RMS, f =50Hz, t =1min	2.5	kV
Creepage distance	-	12.7	mm
Clearance	Press-fit pin	9.15	mm
Comparative Tracking Index	-	>200	-
Module lead resistance, terminals–chip	T_C = 25°C	0.8	mΩ
Weight	-	26.5	g

Thermistor Electrical characteristics

Symbol	Item	Condition	Value			Unit
			Min.	Typ.	Max	
R25	Nominal resistance	-	-	22	-	kΩ
R100	Nominal resistance	T =100°C	-	-	-	Ω
ΔR/R	Deviation of R25	-	-5	-	5	%
-	B-value	B(25/50) , tolerance ±3%	-	3950	-	K
-	B-value	B(25/100) , tolerance ±3%	-	3998	-	K
P_D	Power Dissipation	-	-	200	-	mW

Maximum Ratings (T_j =25°C unless otherwise specified)

Boost IGBT

Symbol	Parameter	Conditions	Ratings	Unit
V_{CES}	Collector-Emitter Voltage	G-E Short	1200	V
V_{GES}	Gate-Emitter Voltage	C-E Short	±20	V
I_C	DC Continuous Collector Current	T_S =80°C	60	A
		T_C =80°C	75	A
I_{CM}	Pulse Collector Current	T_C =80°C, Note1	150	A
P_{tot}	Maximum Power Dissipation	T_S =80°C, T_j =175°C	190	W
		T_C =80°C, T_j =175°C	271	W
T_j	Junction temperature	-	-40 to 175	°C
T_{stg}	Storage temperature	-	-40 to 125	°C

Note1: Pulse width limited by maximum junction temperature

Boost Diode

Symbol	Parameter	Conditions	Ratings	Unit
V_{RRM}	Peak Repetitive Revers Voltage	-	1200	V
I_F	Continuous Forward Current	T_j =T_{jmax} , T_S <80°C	33	A
		T_j =T_{jmax} , T_C <80°C	37	A
I_{FSM}	Surge Forward Current	T_S =25°C	185	A
I^2t	Surge Current Capability	(60Hz single half-sine wave)	142	A^2s
P_{tot}	Total Power Dissipation	T_j =T_{jmax} , T_S <80°C	100	W
		T_j =T_{jmax} , T_C <80°C	118	W
T_{jmax}	Maximum Junction temperature	-	175	°C

Bypass Diode/Boost IGBT Protection Diode

Symbol	Parameter	Conditions	Ratings	Unit
V_{RRM}	Peak Repetitive Revers Voltage	-	1600	V
I_F	Continuous Forward Current	T_j =T_{jmax} , T_S <80°C	43	A
		T_j =T_{jmax} , T_C <80°C	50	A
I_{FRM}	Repetitive Peak Forward Current	T_j =T_{jmax}	200	A
P_{tot}	Total Power Dissipation	T_j =T_{jmax} , T_S <80°C	82	W
		T_j =T_{jmax} , T_C <80°C	100	W
T_{jmax}	Maximum Junction temperature	-	150	°C

IGBT Electrical characteristics (T_j =25°C unless otherwise specified, chip)

Symbol	Item	Condition		Value Min.	Value Typ.	Value Max	Unit
$V_{CE(sat)}$ (Chip)	Collector-Emitter Saturation Voltage	I_C =50A V_{GE} =15V	T_j =25°C	-	1.88	2.25	V
			T_j =150°C	-	2.45	-	V
$V_{GE(th)}$	Gate-Emitter threshold Voltage	I_C =18mA, V_{CE} =V_{GE}		5.0	5.8	6.8	V
C_{ies}	Input capacitance	V_{CE} =25V, V_{GE} =0V f =1MHz	T_j =25°C	-	5.3	-	nF
C_{res}	Reverse transfer Capacitance		T_j =25°C	-	0.12	-	nF
I_{CES}	Collector- Emitter Cut off Current	V_{CE} =1200V, V_{GE} =0V	T_j =25°C	-	-	0.2	mA
I_{GES}	Gate-Emitter Leakage Current	V_{GE} =20V, V_{CE} =0V	T_j =25°C	-	-	0.8	uA
$t_{d(on)}$	Turn-on delay time	V_{CC} =700V I_C =50A V_{GE} =+15V/-8V R_G =5.0Ω Inductive load	T_j =25°C	-	50	-	ns
			T_j =125°C	-	44	-	
t_r	Rise time		T_j =25°C	-	12	-	ns
			T_j =125°C	-	15	-	
$t_{d(off)}$	Turn-off delay time		T_j =25°C	-	148	-	ns
			T_j =125°C	-	173	-	
t_f	Fall time		T_j =25°C	-	170	-	ns
			T_j =125°C	-	217	-	
E_{on}	Turn-on power dissipation		T_j =25°C	-	0.54	-	mJ
			T_j =125°C	-	0.76	-	
E_{off}	Turn-off power dissipation		T_j =25°C	-	3.09	-	mJ
			T_j =125°C	-	4.32	-	
$R_{th(j-c)}$	Thermal Resistance, Junction to Case (IGBT)			-	0.35	-	°C/W
$R_{th(c-s)}$	Thermal Resistance, Case to sink (Conductive Grease applied)			-	0.15	-	°C/W

Assumes Thermal Conductivity of grease is 2.8 W/m･K and thickness is 50um.

Boost Diode Electrical characteristics (T_j =25°C unless otherwise specified, chip)

Symbol	Item	Condition		Value			Unit
				Min.	Typ.	Max	
V_R	Breakdown Voltage	I_R =1mA		1200	-	-	V
I_R	Reverse Leakage Current	V_R =1200V	T_j=25°C	-	3	40	uA
			T_j=150°C	-	93	-	uA
V_F	Diode Forward Voltage	I_F =20A V_{GE} =0V	T_j=25°C	-	1.46	1.6	V
			T_j=150°C	-	2.03	2.65	
t_{rr}	Reverse recovery time	V_{CC} =700V I_C =50A V_{GE} =+15V/-8V R_G =5.0Ω	T_j=25°C	-	0.012	-	us
			T_j=125°C	-	0.016	-	
I_{RM}	Peak reverse recovery Current		T_j=25°C	-	6.0	-	A
			T_j=125°C	-	12.0	-	
Q_{rr}	Recovered charge		T_j=25°C	-	0.048	-	uC
			T_j=125°C	-	0.118	-	
$R_{th(j-c)}$	Thermal Resistance, Junction to Case (Diode)			-	0.8	-	°C/W
$R_{th(c-s)}$	Thermal Resistance, Case to sink (Conductive Grease applied)			-	0.15	-	°C/W

Assumes Thermal Conductivity of grease is 2.8 W/m･K and thickness is 50um.

Bypass/Protection Diode Electrical characteristics(T_j =25°C unless otherwise specified, chip)

Symbol	Item	Condition		Value			Unit
				Min.	Typ.	Max	
V_R	Breakdown Voltage	I_R =5uA		1600	-	-	V
I_R	Reverse Leakage Current	V_R =1600V	T_j=25°C	-	-	5	uA
			T_j=150°C	-	-	1	mA
V_F	Diode Forward Voltage	I_F=16A V_{GE} =0V	T_j=25°C	-	1.0	1.4	V
			T_j=150°C	-	0.9	-	
$R_{th(j-c)}$	Thermal Resistance, Junction to Case (Diode)			-	0.7	-	°C/W
$R_{th(c-s)}$	Thermal Resistance, Case to sink (Conductive Grease applied)			-	0.15	-	°C/W

Assumes Thermal Conductivity of grease is 2.8 W/m･K and thickness is 50um.

Test Conditions

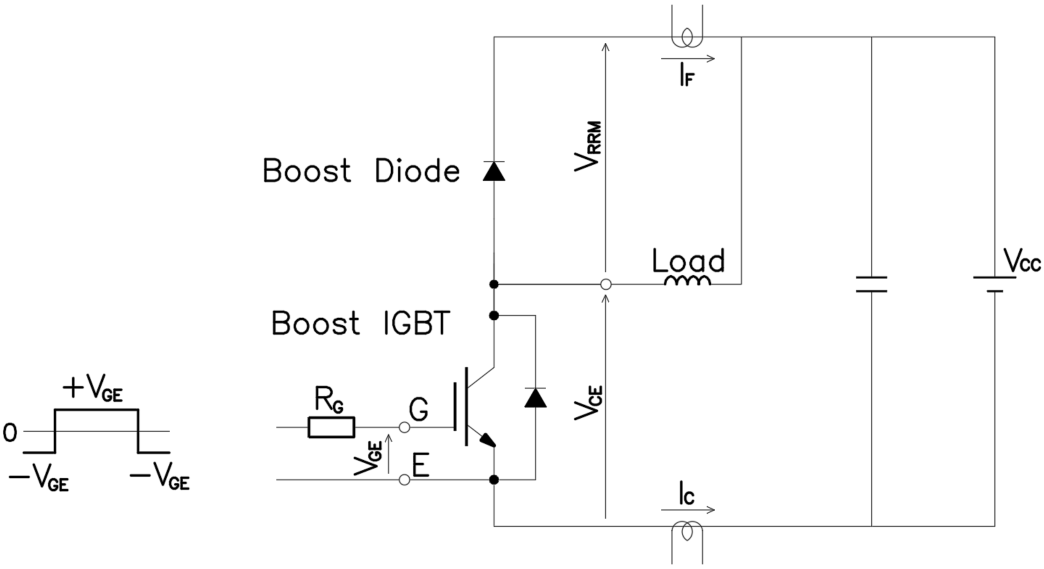


Figure 3. Switching time measure circuit

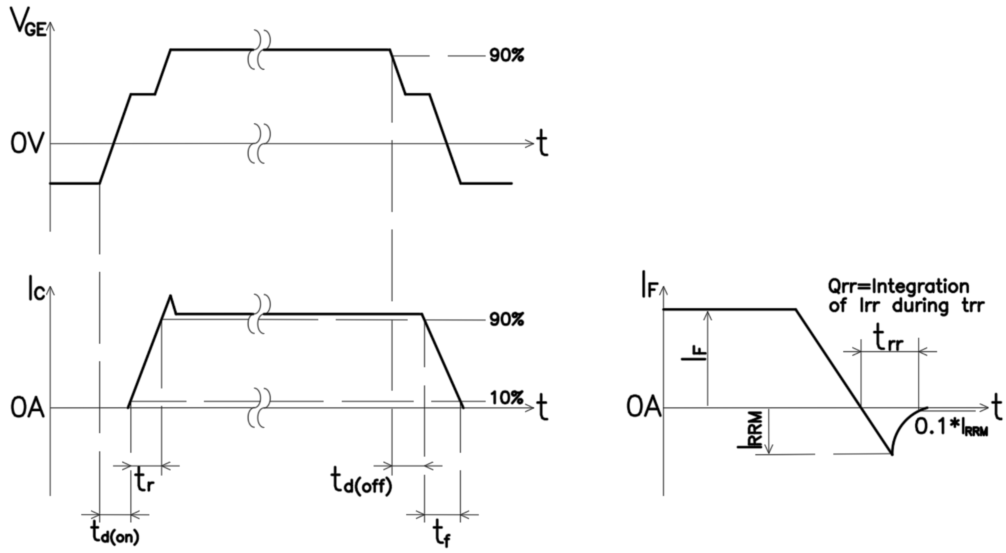


Figure 4. Switching time definition

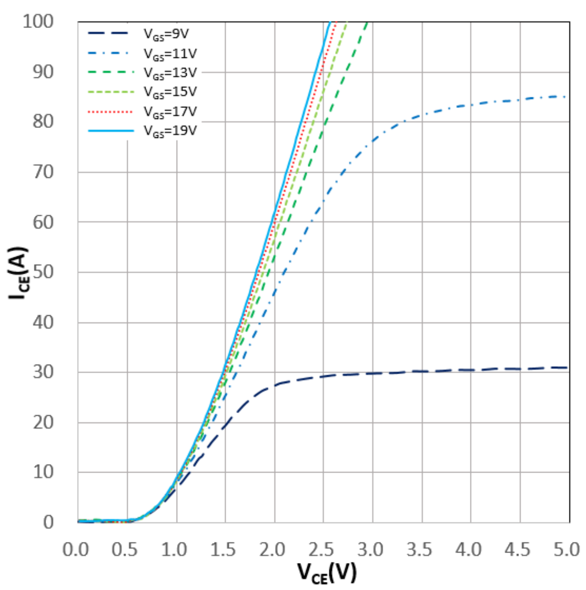


Figure 5. I_{CE} vs V_{CE}

T_j =25°C, V_{GE} parameter

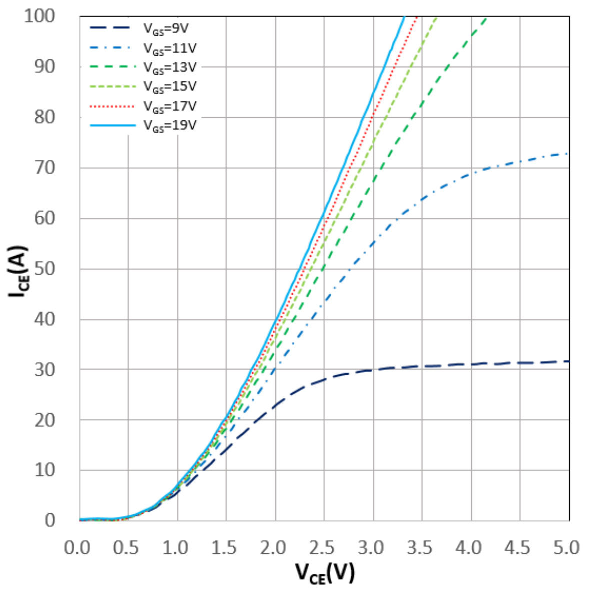


Figure 6. I_{CE} vs V_{CE}

T_j =125°C, V_{GE} parameter

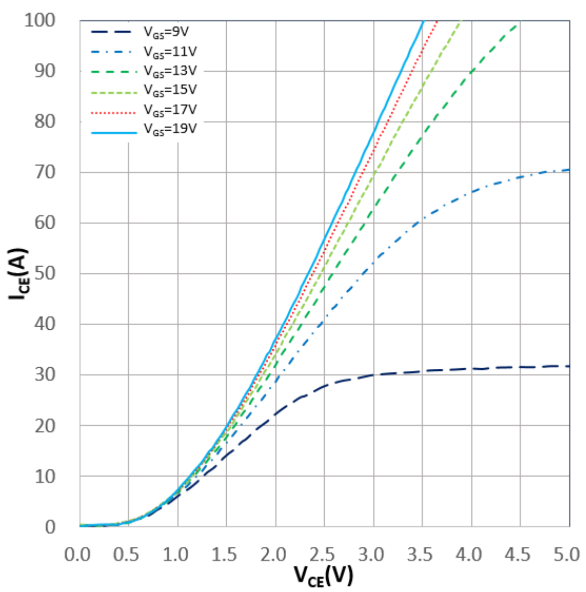


Figure 7. I_{CE} vs V_{CE}

T_j =150°C, V_{GE} parameter

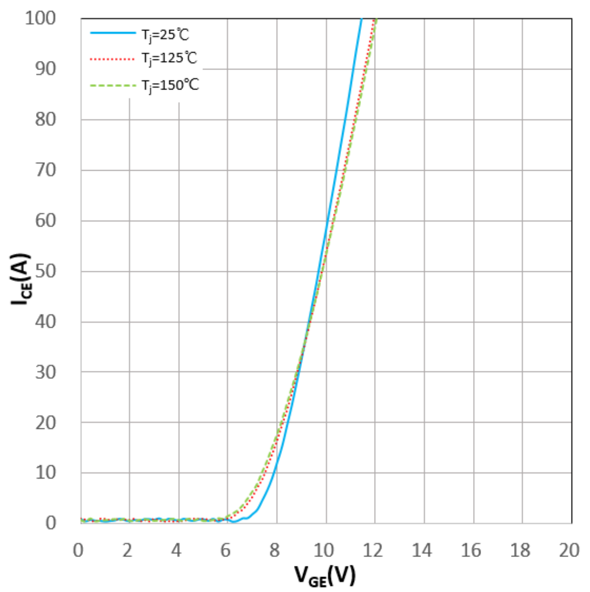


Figure8. I_{CE} vs V_{GE}

V_{CE} =10V, T_j parameter

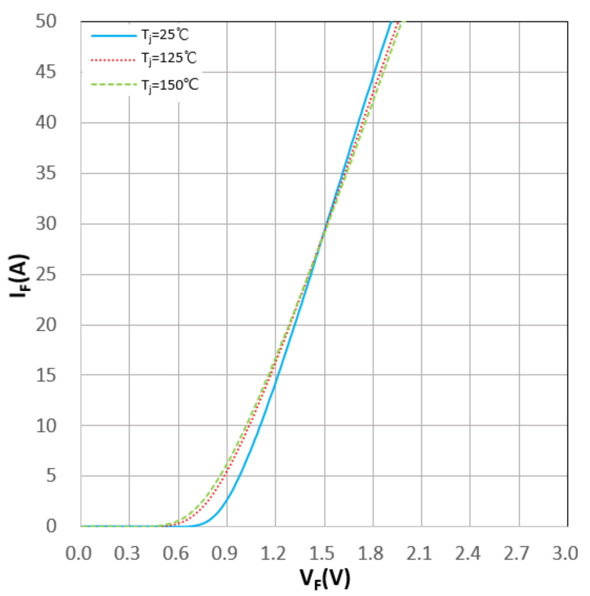


Figure9. I_F vs V_F for Bypass Diode

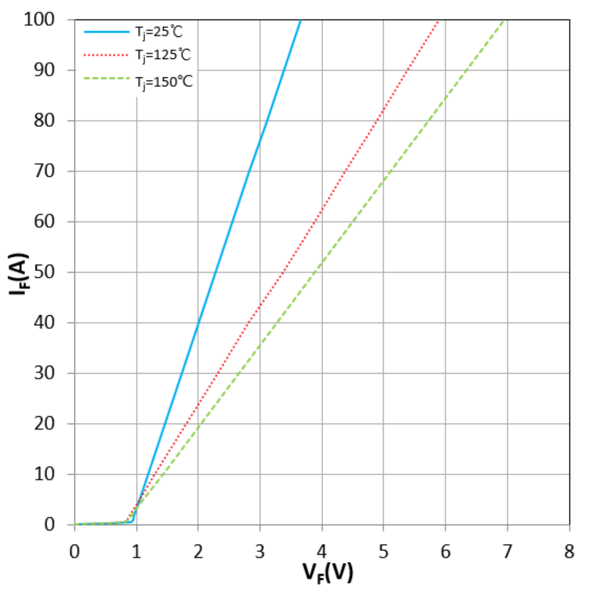


Figure10. I_F vs V_F for Boost Diode

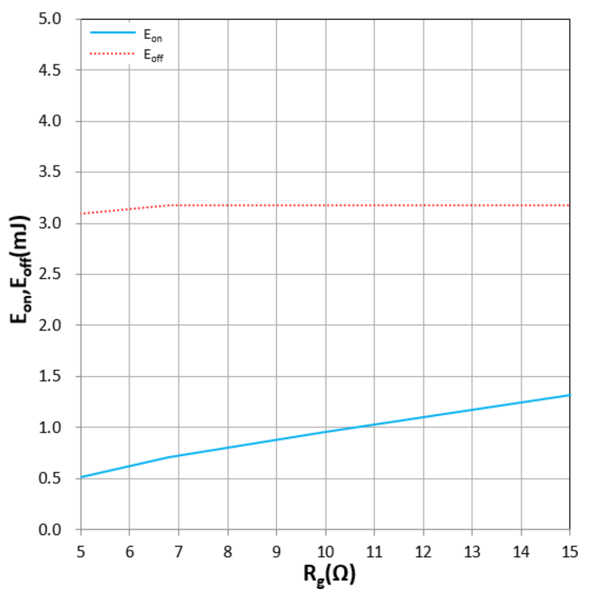


Figure 11. E_{on}, E_{off} vs R_g(Typ)

V_{CC}=700V, I_C =50A , V_{GE}=+15V/-8V, T_j=25°C

Inductive Load

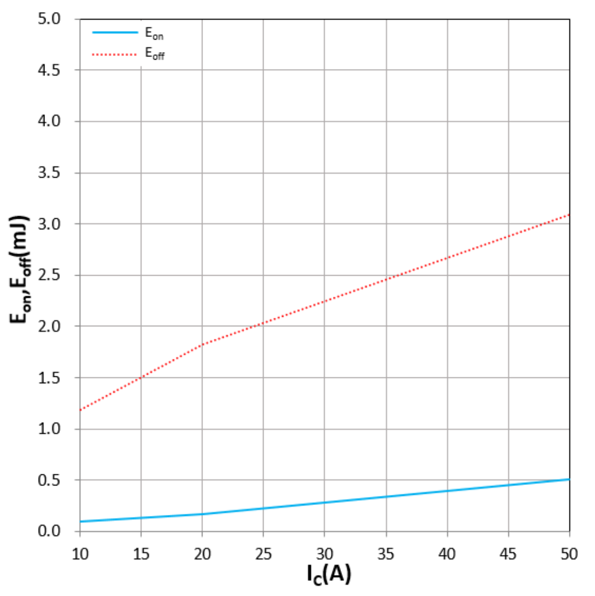


Figure 12. E_{on}, E_{off} vs I_C(Typ)

V_{CC}=700V, R_G=5Ω, V_{GE}=+15V/-8V, T_j=25°C

Inductive Load

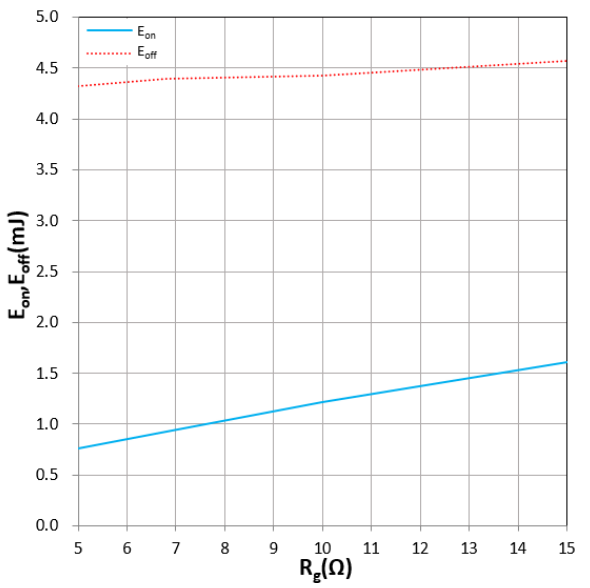


Figure 13. E_{on}, E_{off} vs R_g(Typ)

V_{CC}=700V, I_C=50A, V_{GE}=+15V/-8V, T_j=125°C

Inductive Load

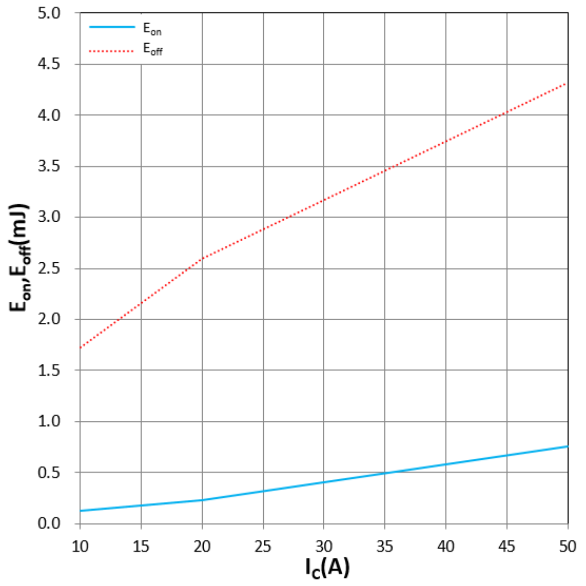


Figure 14. E_{on}, E_{off} vs I_C(Typ)

V_{CC}=700V, R_G=5Ω, V_{GE}=+15V/-8V, T_j=125°C

Inductive Load

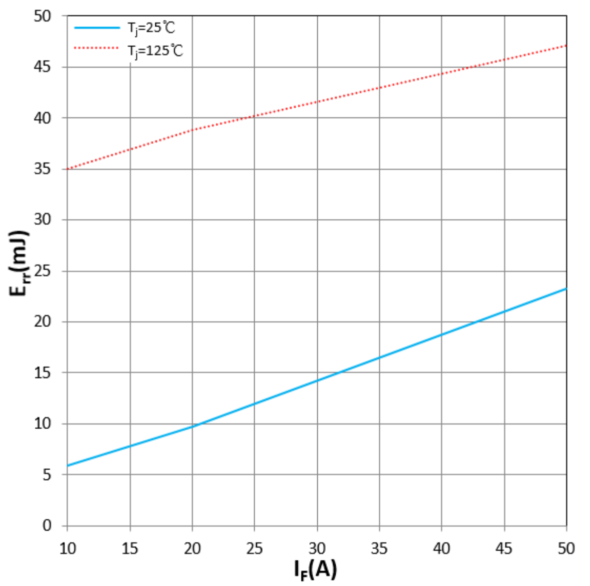


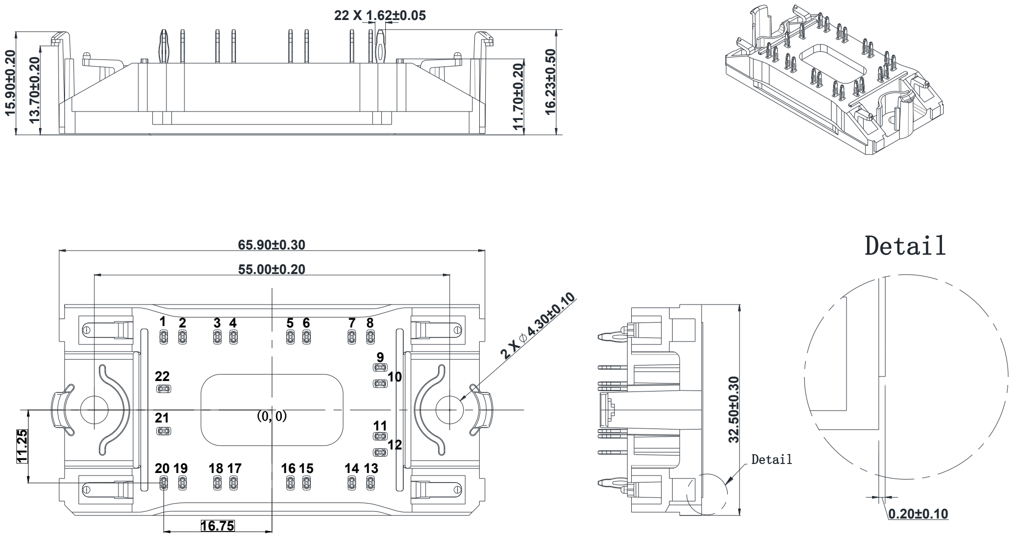
Figure 15. E_{rr} vs I_F

V_{RR}=700V, R_G=5Ω, V_{GE}=+15V/-8V

Inductive Load

Package Dimensions

Pin Table		
Pin	X	Y
1	-16.75	11.25
2	-13.85	11.25
3	-8.45	11.25
4	-5.95	11.25
5	2.85	11.25
6	5.35	11.25
7	12.35	11.25
8	15.25	11.25
9	16.75	6.55
10	16.75	4.05
11	16.75	-4.05
12	16.75	-6.55
13	15.25	-11.25
14	12.35	-11.25
15	5.35	-11.25
16	2.85	-11.25
17	-5.95	-11.25
18	-8.45	-11.25
19	-13.85	-11.25
20	-16.75	-11.25
21	-16.75	-3.25
22	-16.75	3.25



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